COURSE CONTENT

Academic Year : 2013/2014, Semester I.

Course Code & Title : (for undergraduates) MTH418/MH4711
Mathematical modelling in imaging, vision and graphics.
or
(for graduates) MAS 726 Topics in Scientific Computation II.

Pre-requisites : MTH211 / MH2100 - Calculus III,
MAS311 / MTH311 / MH3100 - Real Analysis I.
Numerical analysis and PDEs are recommended.
If you do not satisfy these pre-requisites but wish to take
please seek permission from the lecturer.

Lecturer
Prof Alfred M. Bruckstein

Scheduling of the course
The lecturer is only visiting NTU during the first 8 weeks of semester, so the lectures will only
be for weeks 1 through 8, but during these weeks there will be 5 hours of lectures a week
and 1 hour of tutorial. The final exam will be held during the usual exam period.

Timetable
During Weeks 1-8:
• Lectures on Tuesdays 1330-1530 in Tr+15
• Lectures on Wednesdays 1530-1730 in Tr+15
• Lectures on Thursdays 1130-1230 in Tr+2
• Tutorial on Fridays 1130-1230 in Tr+5

This course is suggested for:
Any student interested in Image Processing, Image Analysis, Computer Vision and
Graphics Applications. We shall study a bit of Differential Geometry, Calculus of
Variation, Vector Fields, and address problems like Shape from Shading, Photometric
Stereo, Stereo Vision, Image, Curve and Surface Smoothing, Denoising and
Deblurring, Curve Completion and Image Inpainting.

Learning Objective:
To understand the mathematical tools used in developing algorithms for
Image Processing and Analysis, Shape Description, Analysis, and Design.

Content
Functions, Curves and Surfaces.
Elements of Differential Geometry.
Vector Fields.
Calculus of Variations.
Level sets.
Applications.

Textbooks/References
Lecture Notes by A. Bruckstein.

Sapiro Guillermo: Geometric PDE’s and Image Analysis, Cambridge.